Social relationships as a major determinant in the valuation of health states

Frick, Ulrich ; Irving, H ; Rehm, Jürgen

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Corresponding Author: Dr. Ulrich Frick, Ph.D.

Corresponding Author's Institution: Carinthia University of Applied Sciences

First Author: Ulrich Frick, Ph.D.

Order of Authors: Ulrich Frick, Ph.D.; Hyacinth Irving, M.Sc.; Jürgen Rehm, Ph.D.

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Suggested Reviewers: jerome Bickenbach
jerome.bickenbach@queensu.ca

Jerry Bickenbach's research is in disability studies, bioethics and philosophy of law. He currently holds a Queen's Research Chair, and was a previous holder of a Killam Fellowship, working on the law and policy of health systems performance assessment, including the legal and ethical aspects of summary measures of population health. Previous research included disability and environmental impact; functional limitation determination for disability pensions; qualitative methodologies for survey instrument development for functional limitation; disability and spirituality; political participation of persons with disabilities; and long term care reform evaluation. Currently, Bickenbach is one of the editors of a five volume Encyclopedia of Disability (Sage). After editing a collection of articles on quality of life, resource allocation and disability (CUP), Bickenbach is preparing a book on disability and equality..

monika Bullinger
bullinge@uke.uni-hamburg.de

Universitätsklinikum Hamburg-Eppendorf,
Institut für Medizinische Psychologie, W26
Martinistraße 52
20246 Hamburg

Published numerous articles on QoL

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Ulrich Frick Carinthia University of the Applied Sciences, Dept. Healthcare Management, Feldkirchen, AustriaPsychiatric University Hospital, Regensburg, Germany

Hyacinth Irving
Centre for Addiction and Mental Health, Toronto, Canada

Jürgen Rehm
Centre for Addiction and Mental Health, Toronto, Canada
University of Toronto, Dalla Lana School of Public Health, Canada
Technische Universität Dresden, Germany

Short title: Social relationships in health state valuations

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mailing address:

Carinthia University of Applied Sciences
Dept. Healthcare Management
Hauptplatz 12
A – 9560 Feldkirchen
Tel: ++43 5 90500 4116
Fax: ++43 5 90500 4110
E-mail: u.frick@cuas.at

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Abbreviations

CLAMES	Classification and Measurement System of Functional Health
CLR	conditional logistic regression
U.S.	United States
WHO	World Health Organization

Introduction

The valuation of health states plays an important role in both summary measures of population health [1], such as disability adjusted life years [2]; as well as in economic evaluations [3], where such valuations are key in determining quality adjusted life years [4]. In the valuation, usually a value between 0 and 1 is assigned to each health state under consideration, which reflects the decrements of health associated with the health state, where the end points are labeled "perfect health" and "death". There is a rich literature on best practices for eliciting such value or weights [5-9], on their philosophical and ethical underpinnings [1;10], and on the way different attributes impact the overall judgment [11-14].

The main focus of this study will be on the impact that limitations on sustaining social relationships have on the valuation of health states. Although social relationships are clearly part of the World Health Organization's (WHO) definition of health [15], they are not always included in the most widely used health valuation instruments, which derive valuations from ratings on a limited number of health state attributes (e.g. pain, anxiety, role functioning). The widely used Health Utilities Index Mark III (HUI3; [16;17]) has no items on social relationships, whereas the Medical Outcomes Study Short-Form 36 (SF-36; [18]) carries an item on social functioning, while the European Quality of Life Five-Dimensions Index Plus (EQ-5D; [19-21]) carries one on usual activities, which is a related concept. The International Classification of Functioning, Disability and Health

[22] clearly delineates social participation as a key dimension, and operationalizations such as the WHO Disability Assessment Schedule II [23] also include the concept.

Conceptually, health state valuations and disability weights assume that there is a unidimensional concept of health and that levels of disability denote corresponding decrements of health. While the existence or the meaningfulness of such a construct has been doubted [10], both empirical research and everyday experience (including proverbs) show that most people, including both laypersons and experts, have no problems in making judgments about health, thus providing indirect evidence that "health" exists as a meaningful concept cognitively [24].

Operationally, health state valuations are mainly derived from comparing health states using either psychometric or economic trade-off methods [8;25-27]. Two main types of health state descriptions can be distinguished: one characterized as a set of standardized attributes (e.g. pain: high level; physical functioning: no limitations; anxiety: moderate level; …); or one characterized by unique salient attributes (e.g. "mild alcohol dependence: this person drinks a lot of alcohol and sometimes has difficulty controlling the urge to drink. While intoxicated, the person has difficulty performing daily activities"; see [8] for a more detailed discussion).

One of the advantages of a standardized list of ordinally scaled attributes is the possibility of empirically determining which attributes are most closely related to health and disability in the judgement of the respondents.

This paper will quantify the relative impact of limitations in sustaining social relationships in comparison to other attributes on valuation of health states. It will further explore the relative impact by level of disability and give examples of health states with and without the marked impact of limitations in sustaining social relationships.

Material and methods

68 clinical experts from four sites in North America, involving staff from more than 20 institutes within the U.S. National Institutes of Health, the Centers for Disease Control and Prevention, the University of Texas, Southwestern, and the Centre for Addiction and Mental Health were asked to evaluate health states using three main methods: pairwise comparison, ranking and Person Trade-Off. All workshop participants gave their written informed consent to take part in this study. The study was approved by the Research Ethics Board of the Centre for Addiction and Mental Health, Toronto, Canada (REB100/2008).

Health states were described using the Classification and Measurement System of Functional Health (CLAMES; [11]; http://www.statcan.ca/bsolc/english/bsolc?catno=82-

005-X20030016643) that was developed by the Health Analysis and Measurement Group, Statistics Canada (see [8] for details). CLAMES is composed of 11 health state attributes, divided into core (pain or discomfort, physical functioning, emotional state, fatigue, memory and thinking, and social relationships) and supplementary (anxiety, speech, hearing, vision, and the use of hands and fingers) attributes. Each of the 11 attributes has 4 or 5 levels, with level 1 representing no loss of health or functioning in that attribute [11].

Only existing health states were presented, with the original list stemming from Statistics Canada and being composed for a comprehensive valuation of all major health states in Canada by means of Standard Gamble exercises in townhall meetings [11]. In addition, about 15% of the 389 health states used were construed by workshop participants representing their respective area of expertise.

All judgments were transformed into pairwise comparisons and analyzed by means of conditional logistic regression (CLR) [28]. In a logistic regression the probability of an outcome is estimated given a set of predictors, in our case from the standardized set of attributes. The sum of the weights is plugged into the logistic function to derive the probability of the event, and thus monotonically related to this event (i.e. the level of disability). We used this sum of regression weights as main descriptive statistic.

Results

Overall, there were 23,840 responses from 68 respondents comparing 379 different health states.

- Insert Table 1 about here -

Table 1 presents the results of the final CLR model. The Estrella Goodness of Fit measure ($R^2 = 0.676$) showed a good fit to the data. There was a clear monotonic relationship between levels of limitation in the capacity to sustain social relationships and the regression coefficients indicating that higher levels of limitations were associated with higher levels of perceived disability. In terms of the absolute impact on disability the most severe limitations with regard to sustaining social relationships (item worded as "no capacity or unable to relate to other people socially") were associated with slightly lower levels of disability as the highest limitation in physical functioning (see Table 1).

- Insert Table 2 about here -

Example health states with and without substantial limitations in sustaining social relationships are given in Table 2. Social relations clearly played a role not only in mental disorders, but also in infections and chronic diseases. Overall, the impact of social relations on health state valuations was only weakly associated with the level of total disability of the respective health state (explained variance = 1.2% ; r = 0.111; n=389; p = 0.029). However, limitations in social relations were highly correlated with limitations in other domains (Spearman correlations > 0.5 for associations with physical functioning, emotional state, memory and thinking, and anxiety). As major influencing factors on health state valuations were substantially correlated, a high correlation resulted

between the regression weights of level of limitations in sustaining social relationships and the overall sum of regression weights indicating disability ($r = 0.741$; $n=389$; $p < 0.001$) .

Discussion

Overall, 'social relationships' was an important determinant in the valuation of health states corroborating the high importance of social relationships in other health state valuations (e.g., [11;29-31]). In the view of the health professionals in our study, as well as in the view of the general population [11], the capacity to sustain social relationships is an integral part of health, and health-related limitations in this capacity are seen as disabling. This result is in line with the well-known definition of the World Health Organization as "not only the absence of infirmity and disease but also a state of physical, mental and social well-being" [15]. However, the WHO definition in many operationalizations and practical implementations has been reduced to being comprised of only mortality and morbidity.

We have demonstrated that health professionals nominated from key U.S. national agencies use limitations in social relationships as an important concept in the valuation of health states. In other words, these professionals particularly associate limitations in social relationships to the detriment of health. Is this justified? Research over the past decades has shown that social relationships are indeed a key constituent of health. House and colleagues [32] in their seminal review, summarized evidence from prospective

studies, which controlled for baseline health status, that consistently showed an increased risk of death among persons with a low quantity, and sometimes low quality, of social relationships. In addition, experimental and quasi-experimental studies of humans and animals also suggest that social isolation is a major risk factor for mortality from widely varying causes [32]. Newer reviews have corroborated this result and have deepened our understanding on the biological and social bases of how limitations in social relationships are associated with disability ([33;34]; for a theoretical framework see [35]). While there still remain many open questions [36], the evidence to date suggests an overall association between social relationships and health.

In light of our results and following the WHO definition of health, we suggest the inclusion of social relationships as a major constitutive part of health. Lastly, even if there are contrary viewpoints, health state descriptions as a basis for valuation should include information on social relationships in order to allow for the systematic exploration of their impact on the valuation process.

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Table 1: Regression weights from conditional logistic regression

	Coefficient	SE	p=
Pain or discomfort			
Pain or discomfort (level 2)	0.252	0.091	0.006
Pain or discomfort (level 3)	1.001	0.102	<0.001
Pain or discomfort (level 4) *	1.001	0.102	<0.001
Physical functioning			
Physical functioning (level 2)	1.031	0.091	<0.001
Physical functioning (level 3)	1.324	0.112	<0.001
Physical functioning (level 4)	2.878	0.129	<0.001
Emotional state			
Emotional state (level 2)	0.353	0.088	<0.001
Emotional state (level 3)	0.679	0.085	<0.001
Emotional state (level 4)	1.047	0.132	<0.001
Emotional state (level 5)	2.276	0.230	<0.001
Fatigue			
Fatigue (level 2)	0.0	0.0	n.a.
Fatigue (level 3)	0.180	0.071	0.011
Fatigue (level 4)	0.733	0.111	<0.001
Memory and thinking			
Memory and thinking (level 2)	0.205	0.089	0.021
Memory and thinking (level 3)	0.205	0.089	0.021
Memory and thinking (level 4)	0.714	0.085	<0.001
Social relationship			
Social relationship (level 2)	0.408	0.079	<0.001
Social relationship (level 3)	0.754	0.089	<0.001
Social relationship (level 4)	1.525	0.120	<0.001
Social relationship (level 5)	2.023	0.328	<0.001
Anxiety			
Anxiety (level 2) *	0.858	0.096	<0.001
Anxiety (level 3) *	0.858	0.096	<0.001
Anxiety (level 4) *	0.858	0.096	<0.001
Hearing			
Hearing (level 2) *	0.936	0.164	<0.001
Hearing (level 3) *	0.936	0.164	<0.001

Hearing (level 4)	3.053	0.167	<0.001
Vision			
Vision (level 2) *	0.791	0.068	<0.001
Vision (level 3) *	0.791	0.068	<0.001
Vision (level 4) *	0.791	0.068	<0.001

SE = Standard error

Reference category is always level 1 (no limitations)
* same regression weights for different levels of disability indicate that the respective categories were estimated as a combined category

Table
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Table 2: Relative impact of social relationships on health state valuations by level of overall disability

Health State	Sum of disablement regression weights	Quintile of regression weights	Percentage of social relationships to sum of regression weights
Theoretically best possible health state	0.00	Hypothetical	0.00
Dental caries (acute)	0.25	Lowest	0.00
Benign colorectal polyps	0.25		0.00
Chicken pox (acute)	0.66		61.79
Mumps (acute)	0.66		61.79
Appendicitis (acute)	2.03	2nd Quintile	0.00
Frostbite (deep - acute)	2.03		0.00
Asperger syndrome (mild pervasive developmental disorder - chronic)	1.78		42.24
HIV infection – untreated	1.61		46.77
Osteoarthritis of the knee or hip – moderate	2.71	3rd Quintile	0.00
Pneumonia (acute)	3.07		0.00
Avoidant personality disorder (chronic)	3.27		46.69
Schizophrenia, chronic, paranoid subtype	3.27		46.69
Fracture (hip - acute)	3.88	4th Quintile	0.00
Osteoarthritis of the knee or hip – severe	4.56		0.00
Tuberculosis (active - contagious)	3.56		42.87
Autism (moderate pervasive developmental disorder - chronic)	4.06		49.82
Dengue Hemorrhagic Fever	5.93	Highest	0.00
Rupture of the aortic wall (acute)	6.26		0.00
Alzheimer's disease (severe - chronic)	5.90		34.28
Disorganized schizophrenia (chronic)	5.10		39.66
Theoretically worst possible health state	14.33	Hypothetical	14.12
Mean (SD) of all n=389 health states	3.28 (2.06)		15.02 (14.71)